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Cancer Commission of Harvard University

SECOND ANNUAL REPORT

OF THE

COLLIS P. HUNTINGTON MEMORIAL HOSPITAL FOR CANCER RESEARCH

AND OF THE

LABORATORIES

OF THE

CANCER COMMISSION OF HARVARD UNIVERSITY

1913–1914

(FOR THE YEAR ENDING JUNE 30, 1914)

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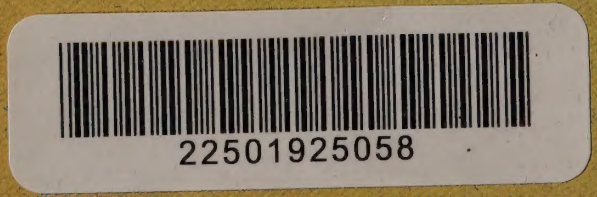

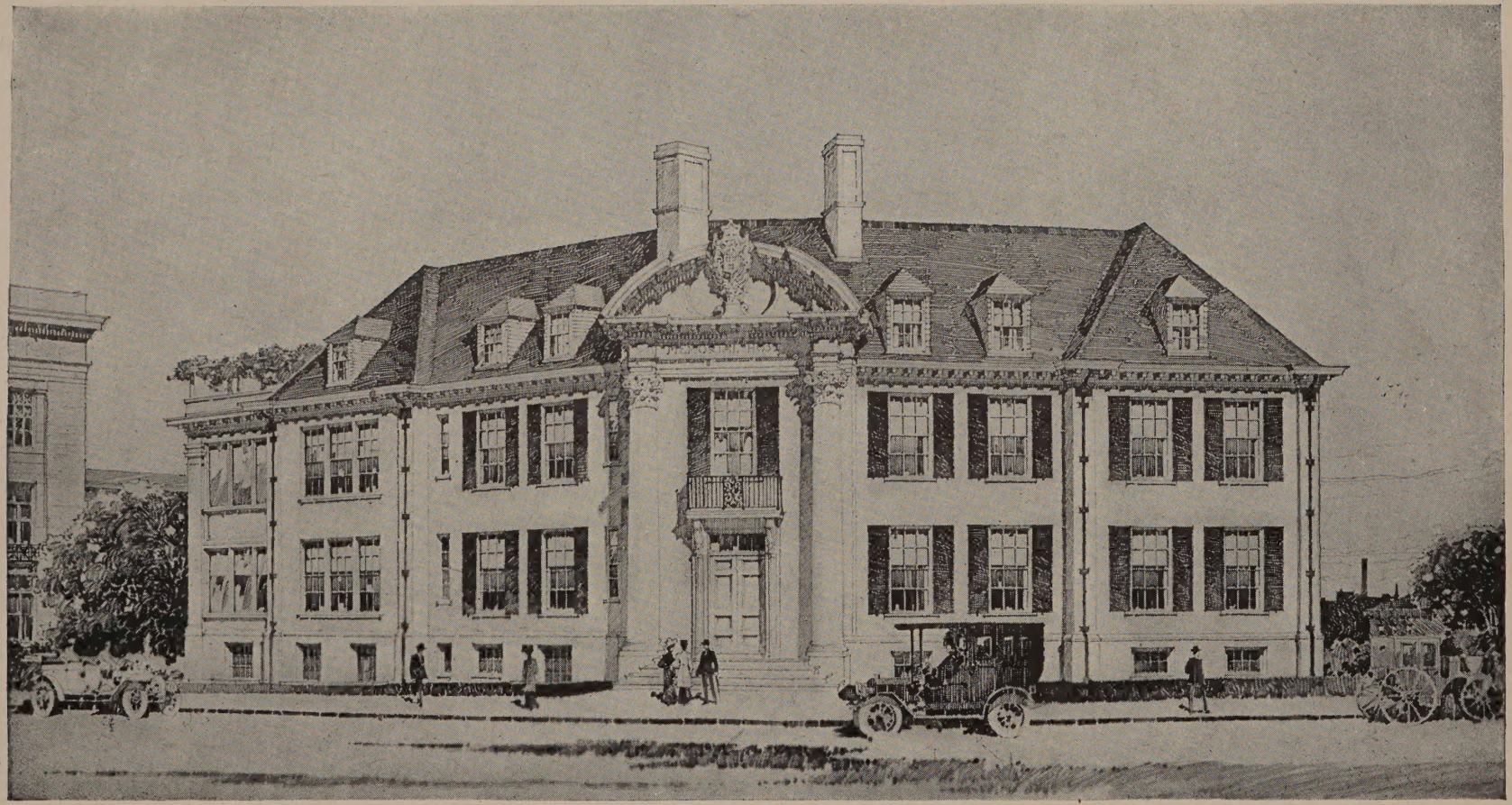

COLLIS P. HUNTINGTON MEMORIAL HOSPITAL FOR CANCER RESEARCH.

THE MEDICAL SCHOOL OF HARVARD UNIVERSITY, BOSTON, MASS.

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Cancer Commission of Harvard University

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THE CANCER COMMISSION OF HARVARD UNIVERSITY

FOUNDED BY CAROLINE BREWER CROFT

JUNE 16, 1899.

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WILLIAM DUANE, PH.D., *Research Fellow in Physics.*

CLARENCE C. LITTLE, PH.D., *Research Fellow in Genetics.*

WILLIAM T. BOVIE, PH.D., *Research Fellow in Physics.*

COLLIS P. HUNTINGTON MEMORIAL HOSPITAL FOR CANCER RESEARCH.

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THOMAS ORDWAY, M.D., *Physician in Charge.*

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THE MEDICAL SCHOOL OF HARVARD UNIVERSITY
LONGWOOD AVENUE, BOSTON, MASSACHUSETTS.

REPORT OF THE CHAIRMAN OF THE COMMISSION

TO THE

CANCER COMMISSION OF HARVARD UNIVERSITY.

GENTLEMEN: I have the honor to submit to you the second annual report of the Collis P. Huntington Memorial Hospital, and of the Laboratories of the Cancer Commission of Harvard University, covering the period from July 1, 1913, to June 30, 1914.

It has been deemed advisable to include with the hospital report a brief statement of the work of the different laboratories of the Commission, namely: The Laboratory of Pathology, under the charge of Dr. E. E. Tyzzer, Director; that of Genetics, in which C. C. Little, Ph.D., Research Fellow of the Cancer Commission, is carrying on experiments in relation to heredity; and the Laboratory of Bio-physics, under the direction of William Duane, Ph.D., assisted by William T. Bovie, Ph.D., both Research Fellows of the Cancer Commission of Harvard University.

Such scientific communications as may be necessary from time to time to present the results of the research work of the Commission will be published in the scientific journals best suited to their presentation, and reprints of these communications will be available for distribution as the work of the members of the Cancer Commission of Harvard University. A list of the scientific publications of the Commission since its origin in 1899 is appended to this report.

The special matters of interest in the work of the past year are recorded in the reports herewith presented, of the Director of the Commission, the Physician in Charge of the Hospital, and the head of the Laboratory of Bio-physics. In considering these reports the Chairman would direct the attention of the Commission to the varied activities which it is now assuming. At the Hospital much good has been

accomplished in the diagnosis and treatment of early cases of cancer, and the so-called pre-cancerous conditions. To the Out-patient Department of the hospital many cases have been referred for diagnosis, advice, and treatment by their attending physicians, and from hospitals and institutions, not only in New England but from as far west as the Pacific Coast. There can be little doubt that a valuable public service has been provided by the Cancer Commission in this respect.

Such cases as were considered suitable for operative treatment by the consulting physicians and surgeons drawn from the different departments of the Harvard Medical School have been referred to other institutions where operative treatment could be best provided for them. Other cases suitable for treatment by X-ray or radium have been treated at the hospital, as in-patients or out-patients, according to their needs. Treatment with radium has been refused in cases where operation was considered by the consulting staff to offer the best prospect for radical cure. A considerable number of incurable cases have been received at the hospital for palliative treatment, and much suffering has been alleviated by good nursing and symptomatic treatment.

The system of careful clinical records, which was instituted by Dr. Ordway, has been maintained. These records include all the data obtained by the methods of precision now available in laboratory tests, and form a store of accurate clinical observations which are already of the greatest scientific value.

The pathological specimens afford abundant material for the work of the pathological laboratory in the classification and morphology of tumors. Hand in hand with the study of this human material from the hospital, Dr. Tyzzer has continued the study of the transplantable tumors of mice. Investigations have been carried on of the effect of radiant energy upon mouse tumors in the laboratory of bio-physics, and a large amount of material has been accumulated for the study of heredity in the occurrence of tumors of mice in the laboratory of genetics. It is to be noted that financial assistance toward the investigation of the latter problem has

been given by the Committee of the Harvard Medical School in charge of the Proctor Fund for the Study of Chronic Diseases. In general it may be said that investigations of importance to the scientific elucidation of the cancer problem, as well as the more practical study of the application of these principles to the treatment of patients suffering from tumors and allied diseases, have resulted from this work.

The Chairman of the Commission acknowledges with gratitude the support of the work of the Commission which has been afforded on every side. Contributions of money to carry on the work of the Commission have been received, and are recorded in the Treasurer's report. Some of these gifts come in the form of annual subscriptions for immediate expenses. Others as donations to the capital funds of the Commission for general use, or for specific objects. A number of the permanent funds of the Commission are given as memorial funds for one or another specific purpose, and a gradual increase of these memorial funds is confidently expected. Surely few opportunities are offered for the expenditure of money toward the alleviation of suffering, not only in the immediate present, but in the future also, more directly than by the establishment of a fund for the investigation of cancer, and the treatment of the unfortunates afflicted with that disease.

It is apparent from the Treasurer's report that funds sufficient to carry on the work of the hospital and of the laboratories next year, on the present scale, are not now at hand. For the past two years the work of the Commission has been made possible only by the generous provision of a large guarantee fund, which was available to cover the annual deficit produced by the excess of expenditure above the income of the invested funds. An additional endowment fund of at least $200,000 is urgently demanded, if the work of the Commission is not to be curtailed. The generous support of the work in the past leads us to believe that this fund will be subscribed, for this Commission has surely

unusual advantage in its close relation to the great resources of the Medical School of Harvard University.

To the heads of the laboratories of the Medical School, and to the many members of the clinical departments of the School, who have shown their disposition to coöperate in the work of the Commission, in every way, the Chairman would express the grateful appreciation of the Commission. To the director of the laboratories, the physician in charge of the hospital, and all of the members of the hospital and laboratory staff, he would also express the recognition of the Commission. From every member of the staff the most courteous and efficient service has invariably been obtained, and to this spirit of coöperative effort, and to the high standard of scientific accuracy in the work of the staff, the success of the year's work must be attributed.

J. COLLINS WARREN,
Chairman.

REPORT OF THE DIRECTOR OF THE COMMISSION

TO THE

CANCER COMMISSION OF HARVARD UNIVERSITY.

GENTLEMEN: The Director has the honor to submit the following annual report of the work of the Cancer Commission of Harvard University for the year ending June 30, 1914.

In the course of the growth of the work of this Commission there has been evolved an organization comprised of several branches: a hospital devoted to the study and treatment of tumor cases, a laboratory of bio-physics, a laboratory of genetics, and a laboratory of pathology and tumor biology. These various branches are engaged in investigations which not only are concerned with pure science, but also in public service which calls for applied science. The functions necessarily fuse into one another, and what is to-day regarded as pure science may to-morrow find practical application in the treatment of patients afflicted with cancer and other tumors.

With the creation and development of its hospital, the Commission has entered upon a broader field of activity, which furnishes opportunity for practical work in the way of public service. While the routine which has developed interferes to some extent with investigation, this influence is offset to some extent in that it brings to the attention of the staff the practical problems in the diagnosis and treatment of human cases, and also affords valuable service in the way of diagnosis, advice and treatment to members of the community suffering from tumors and similar diseases. One of the important functions of the hospital is the thorough trial of various new therapeutic measures which are advocated from time to time, so that it will be possible to point out wherein these are of value, and in what respects they fail.

The data recorded from the various cases studied in the hospital are already beginning to yield a mass of material relating to the natural history of various types of tumors, which is of considerable value.

Both the hospital and the laboratory staff have been engaged during the past year in an investigation of the biological effects and especially of the therapeutic value of radiations derived from radium. The Commission is now in possession of a sufficient amount of radium to test in a thorough manner its value as a therapeutic agent. A large number of tumor cases have received treatment at the Huntington Hospital, and special effort has been made to obtain in each case as accurate data as possible. Many of the results reported in literature of the treatment of tumors, by the new methods which appear from time to time, are vitiated by the failure to verify the clinical diagnosis by a microscopical examination of the tumor, and to recognize the occurrence of fluctuations as natural to the course of the disease. In order that the results obtained may be of value, it is necessary that they should be based in every case on accurate data. With this in view a special effort is made at the Collis P. Huntington Memorial Hospital to record such evidence as will establish the diagnosis in every instance, and also make the record of each case as complete as possible. The results obtained to date in the treatment of various types of tumors by radium were presented to the Massachusetts Medical Society, in June, 1914, by Dr. Ordway as the representative of the Commission. Although sufficient time has not elapsed to determine whether certain cases are "cured," it is already evident that radium is of considerable value as a therapeutic agent. It is found to be effective in certain superficial tumors and conditions of the skin which if neglected are liable to develop into cancer, and especially in both myelogenous and lymphatic leukemia. Hodgkin's disease, although supposed by some authorities to be a form of lymphoma, has not yet been notably affected by radium treatment. Certain uterine tumors even, although of a malignant type, have responded favorably and indicate,

at least, the value of this element for purposes of palliative treatment.

The investigation of the effects of radium has not been limited to the treatment of human cases. A study has been made of its effects on both normal and tumor-bearing animals. The well known destructive effects of large doses on the blood and blood-forming tissues have been studied, and the effects of various methods of application of radio-activity to mouse tumors have been ascertained. In experiments performed in collaboration with Dr. Duane it has been found that radio-activity introduced into the circulation has a greater selective action on the white cells of the blood than on the tumor tissue. As the result of the destruction of the white cells whose function it is to destroy disease germs, animals after receiving large doses are prone to succumb to bacterial infection. A study has been also made, by Drs. J. L. Morris and Ellis Kellert, of the variation in the metabolism as shown by the chemical analyses of the waste products eliminated from the body, both in normal and tumor-bearing animals treated by the X-ray.

The origin and development of tumors has not, as yet, been elucidated by any single discovery, as has been the case in many of the infectious diseases. The prevalence of tumors throughout the animal kingdom is strong evidence against the presence of any single exciting agent, such as a germ or parasite. There is, however, evidence that a variety of agents act in such a way that new growths are eventually produced. It is now known that long continued inflammation is frequently succeeded by a tumor, and various parasitic organisms are capable of producing such chronic inflammation. These, however, account for but a very small proportion of the entire number of tumors which occur. Unusual physical and chemical agents are also known to produce similar results and the frequency of tumors in aniline workers and roentgenologists is well recognized. It is to be noted that certain individuals are peculiarly hypersensitive to certain agents. Thus ordinary light may produce in some persons profound changes in the skin, which are frequently followed by the appearance of tumors.

In the entire animal kingdom there has been found but one species in which tumors arise as the result of an agent presumably of the nature of a virus. Certain tumors of the domestic fowl have been found by Rous in his investigations at the Rockefeller Institute to be produced by agents that are so small that they pass readily through porcelain filters which hold back ordinary bacteria. This, then, is a single instance in which certain types of tumors are possibly due to infection. It is to be noted that the reaction of the tissues of birds to injurious agents is quite different from that observed in mammals, and it is possible that this may account for this exceptional result. Notwithstanding the interest which the work on fowl tumors has aroused, in no instance has a similar infectious agent been demonstrated in tumors of mammals. We have at present, then, no grounds for believing that there is any specific infection associated with human tumors. The distribution of tumor cases tending to show house infection is readily explained either by chance distribution, by the advanced age, or by the inherited tendencies of the occupants of the dwellings under suspicion. The frequency of cancer in the community at large is such that even if the cases were distributed by chance, there would be a great frequency apparent in certain localized areas.

LABORATORY OF GENETICS.

With regard to the significance of heredity in the development of tumors there is much investigation to be done. It is quite impossible to get accurate and complete data extending over successive generations of human beings. It is now known that the principles of heredity which have been determined for other mammals generally apply also to human beings. It seems, therefore, of the greatest importance to turn our attention to the subject of heredity, first with reference to the incidence of tumors in animals. These may be bred rapidly and in accordance with the purposes of the investigation. Small animals, such as rats and mice, are relatively short lived, so that it is necessary to wait but a short

time for them to arrive at the tumor age. Furthermore, it is possible to obtain exact and complete data as to the incidence of tumors in such animals. The results obtained in earlier investigations of this Commission tend to show that there is a greater liability to tumor development in the offspring of tumor parents than in the offspring of parents which never develop tumors. This preliminary finding has received confirmation in results obtained both by the Imperial Cancer Research Fund and by Miss Slye, of Chicago. It is probable that the further investigation of this subject will yield results of great significance. It was noted early in the experimental investigations of this Commission that animals which were immune to certain transplantable tumors were not immune to spontaneous tumors. Furthermore, by cross-breeding non-related varieties of mice it has been found possible to obtain first a generation which was wholly susceptible to a transplantable tumor, and subsequent generations which were quite non-susceptible. This, in itself, furnishes one of the strongest proofs of the non-infectiousness of such tumors. It is difficult at the present time to interpret these results by any of the established principles of inheritance, but having obtained the assistance of Dr. C. C. Little, who will collaborate in the work, the investigation is being continued with the expectancy that the accumulation of sufficient data will furnish a solution of the problem.

The work in the laboratory of genetics has been conducted with mice in the hope that by experiments with them we may be able to analyze and identify some of the conditions in the inheritance of the factors producing tumor growth. It is hoped that in this way information can be obtained which will have an important bearing on the general problems of cancer inheritance and which will aid in the solution of these problems in the human race.

The work on problems in inheritance of inoculated and spontaneous tumors in mice has at the present time arrived at the point where actual experimentation by inoculation can begin.

The past year has been taken up with preliminary work, such as the production of stocks of mice of carefully controlled ancestry, which are to serve as the starting point of work in cross-breeding, and in the study of inheritance.

Attention has especially been given to individual animals in the hope that more critical results can be obtained in this way than from the experimentation with generalized matings, and by the utilization of the strain or race as the unit of study, rather than the individual.

It seems probable that the problems offered by this branch of the work of the Commission are sufficiently complex to require the most careful and painstaking methods of experimentation. Investigations requiring such methods take time, and while the work of investigators of similar problems in which mass methods are used will probably show results before the experiments in progress by the Commission, it seems certain that the more nearly correct answer of these problems will be obtained by the slower and more laborious methods which it appears wise to adopt.

While this applies in part to the work with inoculable tumors, it applies in the fullest degree to the experiments with spontaneous tumors. These experiments must grow slowly and must pass through the long preliminary stage before sufficient numbers of animals can be obtained from closely enough in-bred stock to make them critical.

In the course of the propagation of transplantable tumors much attention has been paid to immunity or resistance to these tumors. This is found to be based on the fact that tumor cells are constantly eliminating substances which react on the surrounding tissues of the animal in which they are implanted. In the so-called susceptible animals these substances stimulate the growth of blood vessels and supporting tissues, enabling the tumor to grow indefinitely until death results. In non-susceptible animals the same substances eliminated from the tumor call forth an inflammation around the latter which eventually results in its destruction. This fact although having no immediate practical bearing on the treatment of tumors explains in a measure the ability of many

tumors to grow at the expense of the other tissues. The matter of the growth of tumors may thus be looked upon as a bio-chemical problem, and its elucidation calls for the development of special technical methods, which are now under investigation.

PATHOLOGICAL LABORATORY.

In addition to the experimental work, the pathological laboratory has carried on the usual routine work during the past year. There have been one hundred and forty-four surgical specimens submitted for diagnosis, and twenty-seven post-mortem examinations have been made. It seems important to record the exact histological findings in each case studied, and not only a copy of the report on each case but the microscopical preparations also are kept on file for future reference. Specimens submitted by physicians as well as those derived from cases under treatment by the Commission are thus permanently filed after being reported and may be referred to at any time. It is of the utmost importance to acquire exact data in order that the study of each case may be made complete, and a post-mortem examination upon each patient who may die while at the Huntington Hospital is thus essential to the efficiency of the work of the Commission. The pathological material of the Commission is available for the instruction of the second year course in pathology in the Harvard Medical School, and the laboratories of the Commission have also been used by fourth year students in elective courses, and by special students.

In order to provide material for the experimental work of the various branches of the Commission, it is necessary to maintain a supply of transplantable tumors. A carcinoma derived from a Japanese waltzing mouse has been propagated continuously for eight years, and a sarcoma originating in a mouse of the same variety has been successfully transplanted for somewhat over one year. Both these tumors grow in practically one hundred per cent of the mice inoculated and present all the usual characters of malignant tumors, so that

they furnish ideal material for various lines of experimentation. They are utilized in investigations on tumor immunity, tumor inheritance, and for testing therapeutic agents. It is important that the work of various other branches of the Commission should be checked up and correlated by pathological evidence, and a considerable portion of the work of the laboratory is directed to this end.

For a more detailed statement of the activities of the other departments of the work of the Commission the reports of Dr. Ordway, Physician in Charge of the Collis P. Huntington Memorial Hospital, and of Dr. William Duane, Research Fellow in Physics, are herewith presented.

E. E. TYZZER,
Director.

REPORT OF THE PHYSICIAN IN CHARGE OF THE HOSPITAL

TO THE

DIRECTOR OF THE CANCER COMMISSION OF HARVARD UNIVERSITY.

DEAR SIR: The Second Annual Report of the Physician in Charge of the Collis P. Huntington Memorial Hospital is herewith respectfully submitted for the year ending June 30, 1914.

During the past year the Cancer Commission of Harvard University has been engaged in an investigation of the value of radium in the treatment of cancer and allied conditions. Up to the present time somewhat over two hundred cases have been treated at the Huntington Hospital. This number is, of course, insufficient, and the time is too short, for a comprehensive critical report on the value of radium therapy. Considerable progress, however, has been made in the accumulation of data for record and subsequent critical review and analysis.

This investigation has necessitated the combined efforts of the entire staff. Dr. E. E. Tyzzer, Director, has had general charge of the work, and has conducted the pathological study of cases. Dr. Thomas Ordway, Physician in Charge, spent three months in the summer and fall of 1913 in Europe investigating the status of cancer therapy with particular reference to the clinical application of radio-active substances, and he has prescribed the radium treatment and has had immediate supervision of all clinical cases. Dr. William Duane, to whom the Commission is indebted for the new methods of application, has been engaged, together with his assistant, Dr. W. T. Bovie, in the preparation of new forms of applicators and in the measurement of their activity. Dr. Ellis Kellert, House Physician, has taken most of the photo-

graphs, and assisted in the clinical work. Dr. R. B. Greenough, Consulting Surgeon, has examined many of the patients in order to decide whether operation was advisable. We are also greatly indebted to Drs. Mosher, Graves, White, Porter, Cushing, Cabot, Jones, Derby, and Bowditch of the Harvard Medical School, who have seen patients in consultation. Much routine or special work has been done by Miss Gibson, Assistant Matron, Miss Sullivan, Head Nurse, Miss Steward, Technician, and Mr. Hammett, Chemist, and Messrs. Kerr and Harris, House Officers.

The cases treated were referred by various institutions and by private physicians. Most of the cases were of inoperable or recurrent cancer. Patients having superficial lesions suitable for radium treatment were treated, for cosmetic effect, at the request of their physicians, and with the approval of the consultants above referred to. A few cases were treated after operation, in prophylaxis of recurrence. Radium treatment was refused in cases in which operation was possible and offered the best hope of cure, with the exception of the superficial lesions above referred to, where delay was of no consequence.

The nature of the pathological conditions presented for treatment was varied, and included papilloma, keratosis, verruca, leukoplakia, superficial and deep rodent ulcers, leukemia, Hodgkin's disease, basal-cell type of carcinoma; sarcoma, round, spindle-cell and melanotic; carcinoma, epidermoid cancer, adeno and alveolar in type. Many parts of the body were affected in the different cases, notably the eye, ear, cheek, nose, mouth, tongue, jaw, neck, larynx, esophagus, breast, abdominal wall, peritoneum, ovary, uterus, rectum, and extremities.

The various forms of applicators, their construction and measurement, will be described in the report of Dr. Duane; the technical details of clinical application in various pathological conditions, methods of recording data, and the results obtained may be found in the preliminary announcement of progress in radium therapy at the Huntington Hospital, in a communication by Dr. Ordway, as a representative

of the Commission, to the Massachusetts Medical Society at its annual meeting in June, 1914.* The apparatus and technic were also exhibited by Drs. Tyzzer, Ordway, and Duane at the annual meeting of the American Medical Association at Atlantic City, June 22–26, 1914.

Up to the present time, as a result of this investigation, it has been shown that the best and apparently curative results from radium therapy were obtained in certain types of skin cancer, and other localized forms of cancer. In myelogenous and lymphatic leukemia under radium treatment the blood picture becomes almost normal, the spleen is reduced remarkably in size, and certain symptoms may be relieved without toxemia resulting. In many cases of true cancer which have advanced beyond the operable stage or in those recurring after operation, improvement under radium therapy may follow not only subjectively, but in the local condition. This improvement may include relief from discharge, hemorrhage and pain, cleansing or healing of ulcerations, diminution in size or disappearance of the local growth. Such cases, however, are rarely cured. Large growths sometimes disappear under the influence of radium, but metastasis, or spreading of the growth to other parts, is not prevented, and, indeed, the patient may succumb to the toxemia resulting from the disintegration of the tumor.

Newer methods may improve the results of radium therapy. At present its proved value is certainly limited, but occasionally cases beyond these indicated limits are distinctly benefited.

The cases observed and treated during the past year are detailed in the accompanying tables:

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* Boston Medical and Surgical Journal, Nov. 19, 1914, Vol. CLXXI., No. 21, p. 771.

TABLE I. — NEW CASES.

Carcinoma.

	Out-patients.	In-patients.	Total.
Head and Neck:			
Face	9	2 (3)*	11 (3)
Basal cell type	9	.....	9
Neck	9	3 (2)	12 (2)
Thyroid	.....	1	1
Tongue	1	(1)	1 (1)
Nose	8	2 (1)	10 (1)
Pharynx	7	1 (1)	8 (1)
Tonsil	1	.....	1
Eyelid	4	.....	4
Lip	4	1 (1)	5 (1)
Mouth (cheek)	1	1	2
Eye	1	.....	1
Larynx	4	1 (2)	5 (2)
Ear	6	2 (3)	8 (3)
Jaw	11	2 (1)	13 (1)
Chest:			
Esophagus	2	1 (2)	3 (2)
Breast	34	6 (6)	40 (6)
Abdomen:			
Stomach			
Peritoneum (ovary)	1	.....	1
Intestine	3	.....	3
Kidney			
Liver	.....	1	1
Carried forward,	115	24 (23)	139 (23)

* The figures in parentheses indicate that a certain number of in-patients were also treated and recorded as out-patients.

TABLE I. — *Continued.*

Carcinoma.— Continued.

	Out-patients.	In-patients.	Total.
Brought forward,	115	24 (23)	139 (23)
Pelvis:			
Uterus	26	21 (10)	47 (10)
Prostate	1	1	2
Testicle	2	(1)	2 (1)
Vagina	1	(1)	1 (1)
Rectum	3	(1)	3 (1)
Spine	.....	1	1
Vulva	1	1 (1)	2 (1)
Extremities:			
Arm	1	.....	1
Total carcinoma	150	48 (37)	198 (37)

Sarcoma.

Pelvis	.....	1	1
Naso-pharynx melanotic	1	(1)	1 (1)
Eye	1	.....	1
Thigh	1	1	2
Shoulder	.....	1	1
Orbit	4	(2)	4 (2)
Humerus			
Frontal sinus	1	(1)	1 (1)
Generalized sarcomatosis			
Total	8	3 (4)	11 (4)

TABLE I. — *Continued.*

Special Tumors and Tumor-like Conditions.

	Out-patients.	In-patients.	Total.
Hodgkin's disease	4	(1)	4 (1)
Leukemia	3	5	8
Lymphoma	4	(1)	4 (1)
Pituitary tumors	1		1
Splenomegaly		1	1
Naso-pharynx chordoma	1	(1)	1 (1)
Total	13	6 (3)	19 (3)
Border-line Growths.			
Fibroma with giant cells (epulis)	1	(1)	1 (1)
Parotid tumor	1		1
Papilloma of bladder	2	(1)	2 (1)
" " tongue	1		1
Breast (adenocystoma papillary)		1	1
Leukoplakia	2	(1)	2 (1)
Rodent ulcers — early — face	6		6
Total	13	1 (3)	14 (3)
Benign Growths.			
Jaw — osteoma	1		1
Thyroid — adenoma	1		1
Arm — multiple lipomata	1		1
Verruca	2		2
Skin (keratosis)	2		2
Jaw — dentigerous cyst	1		1
Total	8		8

TABLE I. — *Concluded.*

Miscellaneous Conditions other than New Growths.

	Out-patients.	In-patients.	Total.
Apprehension of cancer	7	2	9
Syphilis of liver	.....	1	1
Burn by caustic	1	.....	1
Hydrocele	1	.....	1
Raynaud's disease	1	.....	1
Appendicitis			
Fistula in ano	1	.....	1
Retroversion, hyperplasia of endometrium	.....	1	1
Psychasthenia	1	.....	1
Eczema	.....	1	1
Lupus vulgaris	2	.....	2
Tuberculosis of ear	1	.....	1
Keloid — breast	1	.....	1
Amebic dysentery	.....	1	1
Otosclerosis	10	.....	10
Total	26	6	32

TABLE II. — NEW CASES.

Summary.

	Out-patients.	In-patients.	Total.
Carcinoma	150	48 (37)	198 (37)
Sarcoma	8	3 (4)	11 (4)
Special tumors and tumor-like conditions	13	6 (3)	19 (3)
Border-line growths	13	1 (3)	14 (3)
Benign growths	8	.....	8
Miscellaneous conditions other than new growths	26	6	32
Total	218	64 (47)	282 (47)

TABLE III. — OLD CASES.

Cases Listed in Report No. 1, 1912–13, that Continued Treatment in 1913–14.

	Out-patients.	In-patients.	Total.
Carcinoma	7	14	21
Sarcoma	1	1	2
Special tumors and tumor-like conditions	.....	3	3
Border-line growths	1	.....	1
Benign growths			
Miscellaneous conditions other than new growths	3	1	4
Total	12	19	31

TABLE IV. — OLD AND NEW CASES, 1913–1914.

Summary.

	Out-patients.	In-patients.	Total.
Carcinoma	157	62 (37)	219 (37)
Sarcoma	9	4 (4)	13 (4)
Special tumors and tumor-like conditions	13	9 (3)	22 (3)
Border-line growths	14	1 (3)	15 (3)
Benign growths	8	.....	8
Miscellaneous conditions other than new growths	29	7	36
Total	230	83 (47)	313 (47)

	1912–1913.	1913–1914.
Total number of in-patients	75	130
" " " in-patient days	5372	5529
Total number of out-patients	115	230
" " " out-patient visits	482	1634

The number of patients observed and treated in 1913–14, compared with those indicated in the report of 1912–13, has greatly increased. The first annual report included fifteen months, yet, notwithstanding this, the number of out-patients and in-patients has doubled, and the number of out-patient visits has been almost four times as great as last year. This increase has been due chiefly to the development of the treatment by radium and its derivatives, and to the fact that this treatment has been employed not only for inoperable and recurrent cases of cancer, but also to a number of other local lesions for which radium treatment is particularly suited.

A number of patients have been received at the hospital for operation by the Consulting Surgeon, Dr. R. B. Greenough. In a certain number of these cases a combination of operation and radium therapy was believed to offer the best prospect of satisfactory results.

Dr. Kellert, the House Physician, has continued to conduct the X-ray work of the hospital, which has included the routine diagnosis and treatment, and has also studied certain special problems. Through the courtesy and coöperation of Dr. W. D. Coolidge, Dr. Kellert has installed a Coolidge X-ray tube, and has obtained data for subsequent critical review and analysis. The Commission has recently lost the efficient and faithful services of Dr. Kellert, who has resigned to become Director of the Bender Hygienic Laboratory at Albany, New York.

Opportunity for outdoor exercise and recreation for patients is greatly needed, and it is hoped that provision for this can be made, by making use of the land adjoining the hospital, in the form of an old-fashioned garden closed in from the street.

The privileges of the hospital have been extended in two instances to Dr. Richard P. Strong, Professor of Tropical Medicine, of the Harvard Medical School. We are greatly indebted to the members of various departments of the Harvard Medical School for their ready coöperation in the work of the Commission. To the members of the House Staff, the House Physician, the Matron, and to the nurses and employees of the Institution I would also express my grateful appreciation for their devoted services.

Respectfully submitted,

THOMAS ORDWAY, M.D.,
Physician in Charge.

REPORT OF THE MATRON OF THE HOSPITAL

TO THE

PHYSICIAN IN CHARGE OF THE HOSPITAL.

DEAR SIR: I have the honor to submit to you my report for the year ending June 30, 1914.

We are very grateful to many friends for the following gifts to the hospital:

Flowers: Mrs. Moses Williams, Miss Mattie Wood, Mrs. G. H. Shaw, Miss Emily K. Ide, Mrs. Charles G. Weld, Mr. C. H. Greenleaf, Mr. Robert Seaver, Dr. J. Collins Warren, Mr. and Mrs. Roland C. Thorpe, Mr. and Mrs. Hugh Thompson.
Vegetables: Mr. John Hastings.
Books: Mrs. John P. Marshall, Mr. Rundolfur Fjelsted.
Christmas Gifts: Dr. J. Collins Warren, Dr. Thomas Ordway, Dr. Ellis Kellert.
Records for Victrola: Mr. and Mrs. Frederick Hammett.

A concert, which was greatly enjoyed by the patients, was given by the Hospital Music Fund, under the direction of Dr. John Dixwell, on February 15, 1914.

The free beds have been in constant demand, and many deserving persons, in fact a large majority of our patients, have received hospital care without charge.

This humanitarian aspect of the hospital work has been forcefully emphasized by the large number of deserving persons, pitifully afflicted with cancer, who have been cared for at the hospital, some for prolonged periods of time.

To those not familiar with cancer it is difficult to give an adequate idea of the patient and tender care which may be required owing to the long duration of the disease and the distressing disabilities and physical and mental suffering. The comparative comfort afforded by the hospital has been the means of lightening the burdens of these patients, who have always been most appreciative.

The nursing staff has been composed entirely of graduate nurses, but owing to the increased number of patients it has been necessary to employ two maids to assist in the less important ward duties.

I would make special mention of the efficient services of Miss Elizabeth Sullivan, our head nurse, who has resigned.

The invalid occupation work under the direction of Miss Susan Tracy has continued to be helpful to many of the patients. Window boxes were planted and cared for by some of the ambulatory patients, and were greatly enjoyed. We would be very grateful for contributions of potted-plants, for the rooms and wards during the winter.

IRENE W. MASON, R.N.,
Matron.

REPORT OF THE BIO-PHYSICAL LABORATORY

TO THE

DIRECTOR OF THE CANCER COMMISSION OF HARVARD UNIVERSITY.

DEAR SIR: It would seem that the most successful methods of treating malignant disease employ physical rather than chemical principles. Surgery itself is a removal of the diseased tissues by mechanical (*i.e.*, physical) means. Next in importance to surgery the use of rays from radio-active substances may be mentioned. These have a somewhat limited sphere of applicability, but nevertheless satisfactory results have been obtained during the last decade, especially abroad, in the treatment of a large number of superficial cases. X-rays in certain instances produce very similar effects. Ultra-violet light has also been employed.

The Cancer Commission has founded its laboratory of bio-physics primarily for the purpose of studying the application of various forms of radiant energy to malignant tumors, bringing to bear the more advanced principles and more recent discoveries of physical science.

The first problem undertaken by the laboratory was the perfecting of methods of treating tumors by means of the radio-active substances. These methods were suggested several years ago, and described by the writer in some detail at a meeting of the American Association for Cancer Research, in April, 1914.

In order to make clear the principles underlying the methods it will not be out of place to state a few of the well-known facts and laws concerning radium.

Radium is a chemical element belonging to the group of metals; but, unlike most other elements, it transforms itself at a measurable rate into another substance, called radium emanation. The rate of transformation, however, is so slow

that about 1,700 years would be required for half a given quantity of radium to disappear.

The emanation is a chemically inert gas, and it, too, transforms itself into a third substance called radium A. But this is not the end. Radium A transforms itself into radium B, and radium B into radium C, etc., the last of the line known to exist being radium F, also called polonium. None of these substances except the emanation are gases, and they deposit themselves on anything and everything that comes in contact with the emanation, including the walls of the vessel containing it. For this reason radium A B C, etc., frequently are grouped together under one name and called collectively the " deposited activity." All of these substances transform themselves much more rapidly than their parent, radium, does. Half a given quantity of emanation disappears in 3.85 days; of radium A, in 3 minutes; of radium B, in 26.8 minutes; of radium C, in 19.5 minutes, etc. Thus the emanation lasts longer than the deposited activity; the former's life being measured in days, the latter's in hours.

These substances differ from each other very much in their physical and chemical properties, but they all have one characteristic in common, they are radio-active. By the term radio-active we mean that the substance emits a peculiar type of radiation that is quite different from ordinary heat and light radiation. The radio-active radiation, if sufficiently intense, destroys tissues, especially certain kinds of tumor tissues, and this fact forms the basis of the therapeutic application of the radio-active substances.

Among the above mentioned substances radium C produces by far the most powerful and most penetrating rays. Radium B also emits some penetrating rays. Neither radium itself nor the emanation produce rays that are capable of passing through the walls of the glass tubes in which they are usually kept. Why, then, it may be asked, are tubes containing radium used for therapeutic purposes? The answer is that they are not so used until the radium has been in them long enough for the radium B and C to accumulate. When this has occurred, the only function fulfilled

by the radium is to supply radium B and C as fast as they destroy themselves, the latter being the real source of the penetrating radiation.

It follows, therefore, that if by suitable means we deposit radium B C on an applicator or in a tube we can use this applicator or tube to irradiate tissues, just as if it contained radium itself; and this is the fundamental principle of the methods about to be described.

The deposit of radium B C can be obtained in a variety of ways, among which the following may be mentioned:

(1.) The emanation may be extracted from the radium and compressed into a glass or metal container of any desired shape and size, for instance into a tiny capillary tube only a few millimeters long, and the radium A B C allowed to accumulate in it. The container is then ready for use either with or without the emanation, according to the length of time required for the treatment. The emanation, if left in the container, simply prolongs the time during which the activity lasts, by keeping up a supply of radium B C. The emanation itself does not add to the penetrating radiation.

(2.) Radium A B C may be deposited on sheets of metal or other substances by leaving them for several hours in contact with the emanation contained in a suitable vessel. The sheets are then attached, by adhesive plaster or otherwise, to the tissues to be irradiated.

(3.) Radium A B C may be dissolved in water or other liquids either by dissolving the purified emanation and allowing it to transform itself into radium A B C, or by depositing the radium A B C on grains of salt and then dissolving the salt in the liquid. In this way a large amount of activity can be put into a few drops of liquid. The liquid is then injected into the tissues or blood stream.

All of these methods have been used in the laboratories and hospital of the Cancer Commission. The first applications were made by the writer in collaboration with Dr. Robert B. Greenough, in August, 1913, and subsequently in

collaboration with Dr. E. E. Tyzzer, Dr. Thomas Ordway, and others.*

In order that the methods should be of practical value it is necessary to have an efficient machine for collecting and purifying the emanation. Such a machine was designed several years ago by the writer. It is a modification of the apparatus previously employed by Ramsay and Soddy, Rutherford and Debierne. Plate 2 represents the arrangement of the glass tubes and reservoirs. The bulb A contains the radium salt dissolved in water. Radium in solution continually decomposes the water into hydrogen and oxygen gases, at the same time setting free the emanation. This mixture of hydrogen, oxygen, and emanation collects in the tube B, and passes over into the reservoir C, on lowering the mercury from C into D. When it is desired to draw off the emanation the mercury is pushed up into C, forcing the mixture of gases through the mercury trap E into the tubes F. These tubes contain a copper wire slightly oxidized, phosphorpentoxyde and potassium hydroxyde. The copper wire, when heated by an electric current, combines the hydrogen and oxygen, and the phosphorpentoxyde absorbs the water vapor produced. The potassium hydroxyde is for the purpose of absorbing any carbon dioxide gas that may be present. After the purification of the emanation, the mercury in the reservoir G is allowed to flow into H and the emanation passes into G. It is then pushed up by the mercury through the stop-cock I and into the desired tube or container, which is sealed on at N. The system of tubes and bulbs K L M is for the purpose of removing the air from the other tubes and reservoirs, etc., by means of a pump attached to M. This must be done at the beginning, and after that no air enters the reservoirs except occasionally when it becomes necessary to renew the purifying chemicals. This apparatus has been in practically continuous daily use

*Some early experiments by Balthazard, Bouchard and Curie in 1904 showed that the emanation separated from radium could produce profound physiological changes. The Radium Institute of London, however, seems to have been the first to use, systematically, large quantities of emanation in containers for therapeutic purposes. See its reports for 1913 and 1914.

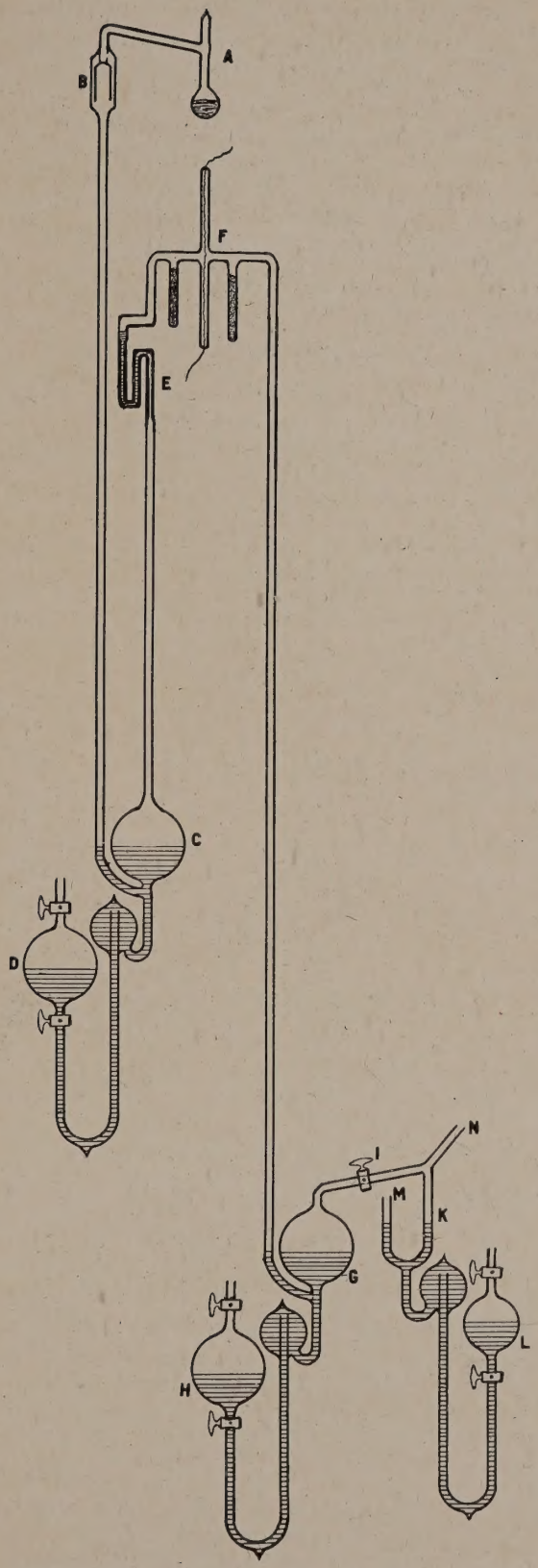
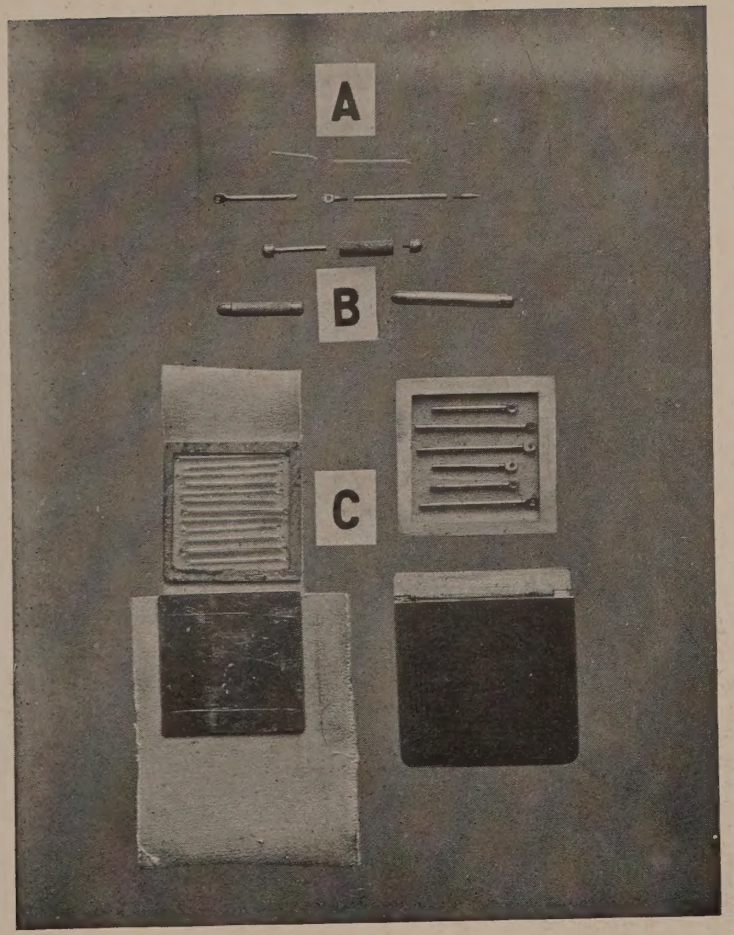


PLATE 2.



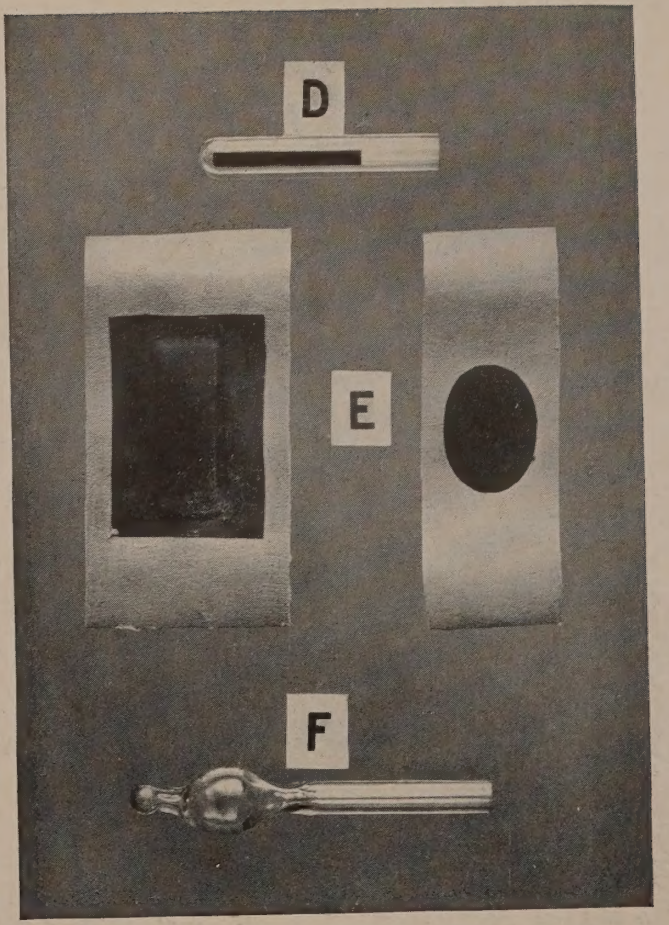


PLATE 3.

for over a year. The bulb A contains over two hundred milligrams of radium (element), and the quantities of emanation extracted and purified during that time, if they were all added together, would be more active than twelve grams of radium. The process of extraction does not require much time. Frequently fifty or sixty millicuries of emanation have been purified and compressed into a small glass tube having a volume less than one cubic millimeter in fifteen or twenty minutes. It will be noticed that no liquid air is required for the purification, and also that the process can be repeated as often as desired without renewing parts of the machine. The importance of these points is evident if frequent supplies of emanation are required.

Plate 3 represents a few of the tubes and applicators used in treating cases. These are applied to tumor tissue according to the well-known methods of using applicators containing radium salts, that are described in the literature and text books on the subject. The tiny glass tubes A contain radium emanation. They fit into the steel tubes just below them, which are provided with eyes and points, as shown. These tubes while strong are used singly, either with or without the silver jackets represented at B. The silver jackets act as filters, cutting off the easily absorbed rays. As the emanation dies away and the tubes become weaker they are placed on flat applicators, as at C. D is a glass tube containing a thin sheet of metal. It illustrates the method of making deposited activity applicators, two of which are represented at E. The glass bulbs F have been used to make highly radio-active salt solutions.

The advantages of the methods outlined above appear to be (a) that the danger of losing the radium itself is reduced to a minimum, (b) that great flexibility is attained, and (c) that a large quantity of a radio-active of long life, like radium, cannot possibly get lodged in the patient's system by accident.

Powerful applicators have been made containing fifty or sixty millicuries per square centimeter of surface, and in other cases the active substances have been spread over large areas. It is possible, also, to obtain a volume distribution of the active substances instead of a surface distribution.

A second problem undertaken by the laboratory has been the development of a method of accurately estimating the intensity and quality of X-radiation. In physical science the principle employed in measuring the intensity of X-rays has been almost without exception the fact that the rays make a gas through which they pass, a conductor of electricity. This phenomenon is called the ionization of the gas. A simple apparatus for measuring this acquired conductivity, or ionization, has been designed.

One of the most remarkable discoveries that has been made recently in this field is that X-rays and also gamma rays from radio-active substances are waves similar to light waves, and have certain definite wave-lengths and frequencies. It seems, therefore, advisable to take the wave-length (or frequency, it does not matter which) of an X-ray as the measure of its quality. The above-mentioned apparatus for measuring the intensity of the X-rays is designed to estimate their wave-lengths also. The wave-lengths are determined by measuring the absorption of the X-rays as they pass through aluminum. From a careful survey of the experimental data it appears that the absorption is proportional to the cube of the wave-length.

Dr. W. T. Bovie has been working in the laboratory on photo-chemical phenomena, and has greatly increased the efficiency of his new quartz mercury-vapor lamp, and provided means for controlling the intensity of the ultra-violet light produced. He has also completed other pieces of apparatus, which will be used in studying the chemical and physiological action of ultra-violet light and other radiations.

It may also be noted that the workshop of the Harvard Medical School has been placed under the charge of this laboratory, and we now have some excellent machines for making apparatus, and three first-class mechanicians, who have found so much to do that they frequently work overtime and into the evening.

WILLIAM DUANE, PH.D.,
Research Fellow in Physics.

REPORT OF THE TREASURER, MR. ARTHUR ADAMS,

TO THE

CANCER COMMISSION OF HARVARD UNIVERSITY.

GENTLEMEN: I have the honor to submit to you my report for the year ending June 30, 1914.

Contributions to the funds of the Cancer Commission of Harvard University have been received by the Treasurer of Harvard College, from July 1, 1913, to June 30, 1914, amounting to $51,219.26. $41,219.26 of this amount was available for current expenses and immediate use. The remainder, $10,000, was contributed to the capital funds of the Cancer Commission.

On the books of the Treasurer of Harvard College, July 1, 1914, the following special funds were listed, the income of which is available for the Cancer Commission of Harvard University:

Cancer Hospital Endowment Fund	$121,513.51
Caroline Brewer Croft Fund	92,025.00
Emily J. Proctor Fund *	2,640.00
Francis Bartlett Free Bed	5,000.00
Lawrence Carteret Fenno Free Bed	5,000.00
Franklin H. Hooper Free Bed	5,000.00
Amos Lawrence Hopkins Free Bed	5,000.00
Clara Endicott Payson Free Bed	5,000.00
Cancer Hospital Proctor Maintenance Fund *	10,633.00
Lawrence Carteret Fenno Light Rays Fund	5,000.00
Cancer Hospital Laboratory Research Fund *	28,309.40
	$285,120 91

* Principal as well as income available for current expenditure.

The invested funds of the Commission thus show a net increase of $8,555.56 during the year 1913–14.

The list of subscribers in 1913–14 to the funds of the Commission is as follows:

To the Cancer Hospital Endowment Fund:		
From an anonymous contributor		$5,000.00
To the Francis Bartlett Free Bed Fund:		
From the estate of Francis Bartlett		5,000.00
To the Emily J. Proctor Fund: *		
($2,500 for radium investigation; $2,500 for welfare of patients in the hospital)		5,000.00
To the Cancer Hospital Laboratory Research Fund:		
Mrs. John A. Burnham	$500.00	
Robert K. Cassatt	100.00	
"In Memoriam"	10,000.00	
Charles C. Jackson	100.00	
Mrs. Henry P. Kidder	100.00	
Mrs. Otis Norcross, Jr.	200.00	
Frederic Parker	50.00	
Wallace L. Pierce	100.00	
John T. and William S. Spaulding	10,000.00	
George R. White	7,000.00	
		28,150.00
To the general purposes of the Cancer Commission of Harvard University:		
From an anonymous contributor		3,584.26
To the Collis P. Huntington Memorial Hospital:		
Subscriptions for current expenses:		
George R. Agassiz	$250.00	
Mrs. Charles W. Amory	100.00	
Mrs. Wilmon Blackmar	5.00	
Mrs. Arthur W. Blake	20.00	
Mrs. John L. Bremer	100.00	
Miss Sarah F. Bremer	50.00	
Miss Fanny R. Brewer	10.00	
Mrs. William S. Bullard	50.00	
Miss Georgina S. Cary	25.00	
Mrs. Theodore Chase	25.00	
Mrs. Frederick S. Clark	5.00	
Herbert L. Clark	100.00	
Miss Mary Curtis	5.00	
Charles A. Dean	25.00	
George H. Doty	25.00	
Arthur F. Estabrook	100.00	
Carried forward,	$895.00	$46,734.26

* For immediate use.

Brought forward,	$895.00	$46,734.26
Miss Harriet Gray	20.00	
Miss Ellen R. Hathaway	100.00	
Mrs. John E. Hudson	10.00	
Humane Society of the Commonwealth of Massachusetts	500.00	
Charles A. King	50.00	
Mrs. Henry P. King	200.00	
Mrs. Henry P. McKean	100.00	
Mrs. Charles E. Mason	100.00	
George B. Morrison	10.00	
Miss Eleanor S. Parker	25.00	
Charles L. Peirson	50.00	
David Pingree	100.00	
Mrs. Alexander S. Porter, Jr.	25.00	
William L. Richardson	100.00	
Mrs. Robert S. Russell	25.00	
John L. Saltonstall	100.00	
Mrs. J. Montgomery Sears	100.00	
Francis P. Sprague	75.00	
Galen L. Stone	100.00	
Miss Alice P. Tapley	100.00	
John E. Thayer	250.00	
"The Eugene Tompkins Memorial"	1,000.00	
Henry O. Underwood	100.00	
Mr. and Mrs. William B. Walker	100.00	
J. Collins Warren	100.00	
Mrs. Charles G. Weld	50.00	
Mrs. Henry C. Weston	100.00	
		4,485.00
		$51,219.26

To all of these contributors the Commission extends its cordial thanks.

I also have the honor to submit to you a report upon the finances of the Cancer Commission of Harvard University, and of the Collis P. Huntington Memorial Hospital for the year ended June 30, 1914. This report has been prepared and audited by Cooley & Marvin Company, Certified Accountants.

ARTHUR ADAMS,
Treasurer.

THE CANCER COMMISSION OF HARVARD UNIVERSITY

REPORT AND ACCOUNTS

YEAR ENDED JUNE 30, 1914

SEPTEMBER 19, 1914.

CANCER COMMISSION OF HARVARD UNIVERSITY, Boston, Massachusetts.

GENTLEMEN: In accordance with your instructions we have supervised the accounting for all funds received and disbursed by the treasurer of your Commission. In reporting thereon we include figures submitted to us by the assistant comptroller of Harvard College pertaining to the funds of the Commission.

We submit the following three exhibits for your consideration:

Exhibit A. — Statement of Funds for the year ended June 30, 1914.

Exhibit B. — Combined Statement of Funds and Cash for the year ended June 30, 1914.

Exhibit C. — Statement of Revenue and Expense for the year ended June 30, 1914.

We call your attention to the following comments upon the matter contained in the above exhibits:

Exhibit A:

This exhibit was compiled from statements furnished us by the assistant comptroller of Harvard College.

Exhibit B:

We have prepared this exhibit in order to present in consolidated form a summary of the transactions shown in the fund accounts detailed on Exhibit A, together with the cash transactions at the hospital.

Exhibit C:

This exhibit presents the details of the revenue and receipts from all sources as well as all items of expense and all other disbursements.

The following revenue was received by the treasurer of Harvard College on account of the Cancer Commission:

Interest on Funds controlled by the Treasurer of Harvard College	$11,046.99
Gifts	47,734.26
Annual Subscriptions	4,485.00
Total	$63,266.25

The difference between the above amount and the total of receipts, aggregating $67,900.69 as shown on Exhibit C, represents receipts by the Collis P. Huntington Memorial Hospital, which amounted to $4,634.44 during the year under review. Interest received during the year on the bank balances maintained by the treasurer of the Commission as working funds amounted to $62.08, which, when added to the interest on funds controlled by the treasurer of Harvard College, agrees with the total interest on funds aggregating $11,109.07, as shown by this exhibit. Above it is treated as part of the receipts by the hospital.

Of the expenses set forth in this exhibit, $957.51 represents annual charges by the university as follows:

Proportionate expense for telephone service	$307.95
Insurance for the year	261.68
University charge—Purchasing agent	44.30
Inspector's office	146.15
Treasurer's office	125.28
Bursar's office	72.15
Total	$957.51

The annual charges of the university as detailed in the foregoing are not under the control of the hospital staff but

in general are determined by the amount of expenses incurred in various departments of the university, which are apportioned upon arbitrary bases of distribution. While some of these items may appear at first sight to be out of proportion to the services rendered, it should be borne in mind that so long as the amounts are within reason there are distinct advantages in being so closely connected with, and part of, the university. Besides the above annual charges there are regular monthly charges by the university for maintenance averaging between two and three hundred dollars, and monthly charges for heat, light, power, hot water and refrigeration, averaging between three and four hundred dollars per month.

Sundry charges amounting to $24,960.69 were paid by the treasurer of Harvard College and charged to the funds of the Commission as follows:

Expenses of a study of the present status of cancer investigation in Europe	$1,790.69
Radium purchased	12,360.00
Radium insurance	60.00
Corporation appointments	10,500.00
Salary—Secretary of Commission	250.00
Total	$24,960.69

The balance of the total expenditure amounting to $33,166.88 was billed direct to the treasurer of the Cancer Commission, and such portion of this amount as has been paid was drawn from funds advanced by the treasurer of Harvard College to the treasurer of the Cancer Commission and from money received as income by the hospital.

General:

It will be observed from an examination of the following tabulation prepared from data shown on Exhibit C, together with a statement of patient and employee days submitted by the accounting department of the hospital, that the average

cost of food per patient and employee per day amounted to $.56 for the year ended June 30, 1914.

In-patient days	5,529	Provisions	$6,040.83
Employee days (est.)	7,174	Kitchen and dining-room	1,179.97
Total in-patient and employee days	12,703		$7,220.80
		Nurses' board	59.50
		Net food cost	$7,161.30

$$\frac{\$7,161.30}{12,703} = \$.56$$

The operating expenses of the hospital, excluding corporation appointments, new equipment, research expenses and various miscellaneous expenses, appear as follows:

Administrative	$4,077.97
General house and property	1,525.97
Housekeeping	5,661.32
Laundry	866.07
Kitchen and dining-room	1,179.97
Provisions	6,040.83
Care of patients	6,384.00
X-ray and photography	379.49
Total	$26,115.62

The above expenses were incurred in connection with 5,529 in-patient days and 1,634 out-patient treatments. Assuming the basis of five out-patient treatments being the equivalent of one in-patient day, the above represents an average cost of $4.46 per patient day. There has been an increase of 157 in the total number of in-patient days as compared with the total of last year as well as an increase of 1,233 in the total number of out-patient treatments. The total expenses of operating the hospital as shown in the foregoing exceed the corresponding total for the previous fiscal year by $2,757.21, and each of the individual classifications set forth show increased expenditures, excepting X-ray and photography.

In considering the foregoing details of expenses, it should be remembered that the following income was received as a result of operations reflected by those expenses:

Board and care of ward patients	$1,261.03
Board and care of private room patients	2,153.19
Out-patient fees and dressings	318.95
Special nursing	10.80
Nurses' board	59.50
X-ray treatments	22.00
X-ray use	100.00
Total	$3,925.47

Notwithstanding the greater number of in-patients and out-patients treated, the total of these receipts shows a decrease of about $127.72 as compared with the total of similar receipts for last year. The income for the year under review, as detailed above, in amount of $3,925.47, is 15% of the related expenditures aggregating $26,115.62, for the same period.

From an examination of Exhibit C it appears that $546.52 was due the hospital as accounts receivable. Of this amount the matron estimates that $125.95 is probably good and collectible, $67.50 having been collected subsequent to June 30, 1914. The remaining balance amounting to $420.57 represents charges covering a period beginning with July, 1912, to the close of the last fiscal year. After further effort has been made to collect the amounts due, those remaining unpaid should be written off.

The total expenses of operation were $43,665.38; the hospital revenue was $4,607.72, and interest received on funds, $11,109.07, making a total revenue of $15,716.79, thus resulting in an operating deficit of $27,948.59, in addition to which there were also expenditures of $14,462.19 for new equipment. Gifts and annual subscriptions were received in the amounts of $47,734.26 and $4,485.00 respectively. For the purpose of proving a balance the excess of gifts and subscriptions over the amount of deficit and payments for new equipment is accounted for in the following manner:

Gain in funds and cash on hand	$9,119.00
Gain in accounts receivable	246.51
Reduction of accounts payable	419.19
Difference between bad accounts and allowances charged off and discounts received	23.78
Total	$9,808.48

Although the net assets have increased during the year in the amount of $9,784.70, it must be remembered that the unrestricted funds have been greatly diminished in meeting the operating deficit and that the new gifts are to a large extent of a restricted nature.

As the result of our supervision and examination of the books and records of the treasurer of the Cancer Commission of Harvard University:

WE HEREBY CERTIFY:

1. That the balance of cash with the treasurer of the Commission and at the hospital June 30, 1914, amounting to $614.88, was on hand as of that date.
2. That the cash shown to have been received at the hospital has been accounted for and that we have seen satisfactory evidence for all disbursements by the treasurer of the Commission.
3. That the following exhibits, A, B, and C, are in accordance with the books of the hospital and statements submitted by the assistant comptroller of Harvard College.

Very truly yours,

COOLEY & MARVIN CO.

H. L. F.
M. M. D.

EXHIBIT A.

THE CANCER COMMISSION OF HARVARD UNIVERSITY, BOSTON, MASS.

Statement of Funds for the Year Ended June 30, 1914.

	July 1, 1913.						June 30, 1914.			1914–15 Income Estimated @ 4.75%.
	Amount.	Principal.	Income.	Receipts.	Disbursements.	Increase ¶ or Decrease.	Principal.	Income.	Amount.	
Cancer Hospital Endowment	$116,513.51	$116,513.51	x	$11.152.49	$6,152.49	*$5,000.00*	$121,513.51	. . . . .	$121,513.51	$5,771.91
Cancer Hospital Maintenance	. . . . .	. . . . .	=	1,000.00	1,000.00					
Caroline Brewer Croft Fund	92,025.00	92,025.00	*	5,033.28	5,033.28	. . . . .	92,025.00	. . . . .	92,025.00	4,371.19
Emily J. Proctor Fund	. . . . .	. . . . .	=	5,000.00	2,360.00	*2,640.00*	2,640.00	. . . . .	2,640.00	125.40†
Francis Bartlett free bed	. . . . .	. . . . .	※	5,113.00	113.00	*5,000.00*	5,000.00	. . . . .	5,000.00	237.50
L. C. Fenno " "	5,000.00	5,000.00	z	255.00	255.00	. . . . .	5,000.00	. . . . .	5,000.00	237.50
F. H. Hooper " "	5,000.00	5,000.00	z	255.00	255.00	. . . . .	5,000.00	. . . . .	5,000.00	237.50
A. L. Hopkins " "	5,000.00	5,000.00	z	255.00	255.00	. . . . .	5,000.00	. . . . .	5,000.00	237.50
C. E. Payson " "	5,000.00	5,000.00	z	255.00	255.00	. . . . .	5,000.00	. . . . .	5,000.00	237.50
Cancer Hospital Proctor Maintenance	22,477.31	22,477.31	z	582.45	12,426.76	**11,844.31**	10,633.00	. . . . .	10,633.00	505.07†
L. C. Fenno Memorial — treatment by light rays	5,390.13	5,000.00	$390.13 z	274.89	665.02	**390.13**	5,000.00	. . . . .	5,000.00	237.50
Cancer Hospital research	20,159.40	20,159.40	c	29,605.14	21,455.14	*8,150.00*	28,309.40	. . . . .	28,309.40	1,344.70†
Gift Salary Sec. Cancer Com.	. . . . .	. . . . .	. . . . .	. . . . .	250.00	**250.00**	. . . . .	**$250.00**	**250.00**	**11.88**
Total	$276,565.35	$276,175.22	$390.13	$58,781.25	$50,475.69	*$8,305.56*	$285,120.91	**$250.00**	$284,870.91	$13,531.39

Note: x Interest, $6,152.49; Gift, $5,000.00. = Gifts. * Interest, $1,449.02; Gift, $3,584.26. ※ Interest, $113.00; Gift, $5,000.00.
z Interest. c Interest, $1,455.14; Gift, $28,150.00. ¶ Increases are in italics, decreases in black face type.
† If the balances of these funds are decreased the rate of income will be less.

EXHIBIT B.

THE CANCER COMMISSION OF HARVARD UNIVERSITY,

BOSTON, MASS.

Combined Statement of Funds and Cash for the Year Ended June 30, 1914.

Balance of Funds July 1, 1913	$276,565.35	
" " Cash with Treasurer July 1, 1913 (**overdrawn**)*	**223.56**	
" " Hospital Petty Cash Fund	25.00	
Total Funds and Cash July 1, 1913		$276,366.79
Receipts for year — Exhibit C	$67,900.69	
Disbursements for year — Exhibit C	58,781.69	
Excess of Receipts over Disbursements,		9,119.00
Balance of Funds June 30, 1914	$284,870.91	
" " Cash with Treasurer June 30, 1914	584.88	
" " Hospital Petty Cash Fund	30.00	
Total Funds and Cash June 30, 1914		$285,485.79

*Decreases recorded in black face type.

EXHIBIT

THE CANCER COMMISSION

BOSTON,

Statement of Revenue and Expense

EXPENSE.

Accounts payable July 1, 1913			$3,629.10
Administrative		$4,077.97	
General house and property		1,525.97	
Housekeeping		5,661.32	
Laundry		866.07	
Kitchen and dining-room		1,179.97	
Provisions		6,040.83	
Care of patients		6,384.00	
Physical laboratory		917.87	
X-ray and photography		379.49	
Research laboratory		2,406.91	
Department of genetics		702.12	
Corporation appointments		10,750.00	
Miscellaneous:			
Traveling	$227.50		
Publications	386.48		
American Medical Assoc. exhibition advances	200.00		
Research work abroad	1,790.69		
Sundry	168.19		
		2,772.86	
Expense of operation		$43,665.38	
New equipment:			
General house and property	$396.99		
Physical laboratory:			
Radium	12,360.00		
Other	1,167.61		
X-ray and photography	294.41		
Department of genetics	243.18		
		14,462.19	
Total expenditures		$58,127.57	
Other disbursements:			
Cost of supplies sold and expenses refunded (Contra)	$171.69		
Reimbursement for overpayment of account (Contra)	20.00		
Overpayment of account by Hospital (Contra)	23.03		
Deposit by patient refunded (Contra)	48.00		
		262.72	
			58,390.29
			$62,019.39
Deduct: Disbursements — Exhibit B		$58,781.69	
Discounts taken		27.79	
			58,809.48
Accounts payable June 30, 1914			$3,209.91

C.

OF HARVARD UNIVERSITY,

MASS.

for the Year Ended June 30, 1914.

REVENUE.

Accounts receivable July 1, 1913			$300.01
Board and care of ward patients		$1,261.03	
Board and care of private-room patients		2,153.19	
Out-patient fees and dressings		318.95	
Radium treatments		351.00	
X-ray treatments		22.00	
Pathological examinations		245.00	
Clinical examinations		20.00	
X-ray use		100.00	
Radium use		40.00	
Special nursing		10.80	
Nurses' board		59.50	
Teaching		29.25	
Miscellaneous (to be deducted)		3.00	
Hospital revenue		$4,607.72	
Other Hospital receipts:			
Sale of supplies and refunds of expenses (Contra)	$171.69		
Overpayment of account by patient (Contra)	20.00		
Overpayment of account by Hospital (Contra)	23.03		
Deposit by patient (Contra)	48.00		
		262.72	
Interest on Funds		11,109.07	
Gifts		47,734.26	
Annual subscriptions		4,485.00	
			68,198.77
			$68,498.78
Deduct: Receipts — Exhibit B		$67,900.69	
Worthless accounts receivable and allowances		51.57	
			67,952.26
Accounts receivable June 30, 1914			$546.52

LIST OF COMMUNICATIONS
CANCER COMMISSION OF HARVARD UNIVERSITY.

1. Statistics of Cancer — W. F. Whitney.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2, p. 33. Oct. 23, 1900.

2. On the Etiology of Cancer — E. H. Nichols.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2. pp. 34–58. Oct. 23, 1900.

3. Report of the Presence of "Plimmer's Bodies" in Carcinomatous Tissue — R. B. Greenough.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2, pp. 59–62. Oct. 23, 1900.

4. Tumors and Sporozoa of Fishes — E. E. Tyzzer.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2, pp. 63–68. Oct. 23, 1900.

5. The Reconstruction of a Nodule of Cancer — E. A. Locke.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2, pp. 69–71. Oct. 23, 1900.

6. Report of Culture Experiments made with Carcinomatous Tissue, 1899–1900 — Oscar Richardson.
   Boston Society of Medical Sciences, Journal, Vol. 5, No. 2, pp. 72–80. Oct. 23, 1900.

7. Coccidium Infection of the Rabbit's Liver — E. E. Tyzzer.
   Journal of Medical Research, Vol. 7, No. 3, pp. 235–254. April, 1902.

8. Molluscum Contagiosum — Charles J. White and W. H. Robey, Jr.
   Journal of Medical Research, Vol. 7, No. 3, pp. 255–277. April, 1902.

9. Culture Experiments with Malignant Tumors — Oscar Richardson.
   Journal of Medical Research, Vol. 7, No. 3, pp. 278–279. April, 1902.

10. Four Pathogenic Torulæ (Blastomycetes) — Joseph D. Weis.
    Journal of Medical Research, Vol. 7, No. 3, pp. 280–311. April, 1902.

11. The Relation of Blastomycetes to Cancer — E. H. Nichols.
    Journal of Medical Research, Vol. 7, No. 3, pp. 312–359. April, 1902.

12. Cell Inclusions in Cancer and in Non-cancerous Tissue. R. B. Greenough.
Journal of Medical Research, Vol. 7, No. 3, pp. 360–380. April, 1902.

13. A Contribution to the Classification of Tumors — F. B. Mallory.
Journal of Medical Research, Vol. 13, No. 2, pp. 113–136. January, 1905.

14. On the Nature of the Cell Inclusions of Cancer — R. B. Greenough.
Journal of Medical Research, Vol. 13, No. 2, pp. 137–166. January, 1905.

15. The Effects of the Röntgen Ray upon Cancer — Robert H. Vose and Walter C. Howe.
Journal of Medical Research, Vol. 13, No. 2, pp. 167–185. January, 1905.

16. Implantation of Tissue and its Relation to Cancer — E. H. Nichols.
Journal of Medical Research, Vol. 13, No. 2, pp. 187–232. January, 1905.

17. The Inoculable Tumors in Mice — E. E. Tyzzer.
Journal of Medical Research, Vol. 17, No. 2, pp. 137–153. November, 1907.

18. A Series of Twenty Spontaneous Tumors in Mice, with the Accompanying Pathological Changes and the Results of the Inoculation of Certain of these Tumors into Normal Mice — E. E. Tyzzer.
Journal of Medical Research, Vol. 17, No. 2, pp. 155–197. November, 1907.

19. A Study of Heredity in Relation to the Development of Tumors in Mice — E. E. Tyzzer.
Journal of Medical Research, Vol. 17, No. 2, pp. 199–211. November, 1907.

20. A Transmissible Cancer of the Rat considered from the Standpoint of Immunity — F. P. Gay.
Journal of Medical Research, Vol. 20, No. 1, pp. 175–201. January, 1909.

21. The Lesions of the Skin and the Tumor Formations in Xeroderma Pigmentosum — W. T. Councilman and G. B. Magrath.
Journal of Medical Research, Vol. 21, No. 3, pp. 331–355. October, 1909.

22. The Surgical Treatment of X-ray Carcinoma and Other Severe X-ray Lesions, based upon an Analysis of Forty-seven Cases — C. A. Porter.
Journal of Medical Research, Vol. 21, No. 3, pp. 357–413. October, 1909.

23. The Pathological Histology of Chronic X-ray Dermatitis and Early X-ray Carcinoma — S. B. Wolbach.
Journal of Medical Research, Vol. 21, No. 3, pp. 415–449. October, 1909.

24. Chronic Pancreatitis with Tumor-like Nodules in the Cat — Thomas Ordway.
Journal of Medical Research, Vol. 21, No. 3, pp. 451–458. October, 1909.

25. Tumors in the Common Fowl — E. E. Tyzzer and Thomas Ordway.
Journal of Medical Research, Vol. 21, No. 3, pp. 459–477. October, 1909.

26. A Series of Spontaneous Tumors in Mice with Observations on the Influence of Heredity on the Frequency of their Occurrence — E. E. Tyzzer.
Journal of Medical Research, Vol. 21, No. 3, pp. 479–518. October, 1909.

27. A Study of Inheritance in Mice with Reference to their Susceptibility to Transplantable Tumors — E. E. Tyzzer.
Journal of Medical Research, Vol. 21, No. 3, pp. 519–573. October, 1909.

28. The Nature of the Reaction of the Tissues of Susceptible and Non-susceptible Mice to an Inoculable Tumor — A. M. Burgess.
Journal of Medical Research, Vol. 21, No. 3, pp. 575–590. October, 1909.

29. The Effect of Trypsin on Cancer and on the Germ Cells in Mice — Stephen Rushmore.
Journal of Medical Research, Vol. 21, No. 3, pp. 591–596. October, 1909.

30 The Treatment of Cancer with Body Fluids and Cancerous Ascitic Fluid — E. H. Risley.
Journal of the American Medical Association, Vol. 56, pp. 1383–1389, May 13, 1911.

31. The Hemolytic Skin Reaction in Carcinoma — E. H. Risley.
The Boston Medical and Surgical Journal, Vol. 165, No. 4, pp. 127–128. July 27, 1911.

32. The Gilman-Coca Vaccine Emulsion Treatment of Cancer — E. H. Risley.
The Boston Medical and Surgical Journal, Vol. 165, No. 21, pp. 784–788. Nov. 23, 1911.

33. The Huntington Hospital and the Scope of its Work — E. E. Tyzzer and Thomas Ordway.
Boston Medical and Surgical Journal, Vol. 166, No. 2, pp. 887–889. June 13, 1912.

34. Tumor Investigation — A General View of Various Lines of Activity — E. E. Tyzzer.
Harvard Graduates' Magazine, Vol. 21, No. 82. December, 1912.

35. The Collis P. Huntington Hospital for Cancer Research — Robert B. Greenough and Thomas Ordway.
Harvard Graduates' Magazine, Vol. 21, No. 82, December, 1912.

36. Factors in the Production and Growth of Tumor Metastases — E. E. Tyzzer.
Journal of Medical Research, Vol. 28, No. 2, pp. 309–332. July, 1913.

37. The Complement Content of the Blood in Malignant Disease — Thomas Ordway and Ellis Kellert.
Journal of Medical Research, Vol. 28, pp. 287–299. July, 1913.

38. The Protein Metabolism in Certain Tumor-bearing Rats — Thomas Ordway and J. Lucien Morris.
Journal of Medical Research, Vol. 28, No. 2, pp. 301–308. July, 1913.

39. The Use of Radium in Cancer and Allied Conditions at the Huntington Hospital — Illustrative Cases. A report of the Cancer Commission of Harvard University, presented by Thomas Ordway.
Boston Medical and Surgical Journal, Vol. 171, No. 21, pp. 771–781. Nov. 19, 1914.

FORM FOR DONATIONS AND BEQUESTS.

I give, devise and bequeath unto the President and Fellows of Harvard College, the sum of $..... to be used for the work of the Cancer Commission of Harvard University.